



**Energy Efficiency and Renewable Energy
Federal Energy Management Program**

Federal Supply Sources:

- Defense Logistics Agency (DLA)
Phone: (800) DLA-BULB
dscp103.dscp.dla.mil/gi/general/light1.htm
- General Services Administration (GSA)
Phone: (817) 978-8640
www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- FEMP's *Federal Lighting Guide* and other resources provide helpful guidance on lighting projects.
Phone: (800) 363-3732
www.eren.doe.gov/femp/resources/lighting.html
- National Electrical Manufacturers Association (NEMA) publishes Standards Publication LE5-1993, *Procedure for Determining Luminaire Efficacy Ratings for Fluorescent Luminaires*.
Phone: (800) 854-7179
www.nema.org
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Guide to Energy-Efficient Commercial Equipment*, which includes a chapter on lighting.
Phone: (202) 429-0063
aceee.org
- Lighting Research Center publishes helpful information on fluorescent lighting.
Phone: (518) 276-8716
www.lrc.rpi.edu
- Illuminating Engineering Society of North America (IESNA) publishes ANSI/IESNA RP-1-1993, *American National Standard Practice for Office Lighting*, which includes recommendations for offices with VDTs.
Phone: (212) 248-5000 x112
www.iesna.org
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 484-7950

How to Buy Energy-Efficient Fluorescent Luminaires

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

Efficiency Recommendations

Luminaire Type (NEMA designation)	# of Lamps	Recommended LER	Best Available LER
2' x 4' Recessed			
Lensed (FL)	2	62 or higher	77
	3	61 or higher	77
	4	61 or higher	77
VDT-preferred Louvered (FP)	2	50 or higher	61
	3	51 or higher	59
	4	54 or higher	61
Plastic Wraparound			
Four-Foot (FW)	2	63 or higher	88
	4	62 or higher	100
Strip Lights			
Four-Foot (FS)	1	70 or higher	86
	2	70 or higher	92
Industrial			
Four-Foot (FI)	2	67 or higher	91
Eight-Foot (FI)	2	68 or higher	86
2' x 2' Recessed, for U-Tube Lamps			
VDT-preferred	2	41 or higher	63
Lensed	2	49 or higher	78

Definitions

Luminaire is a complete lighting unit consisting of a fixture along with one or more ballasts and lamps.

Luminaire Efficacy Rating (LER) describes the efficiency of a luminaire in terms of rated light output (in lumens) per watt of electricity use.

Lumen is a measure of light output.

VDTs, or video display terminals (computer monitors), may be obscured by direct or reflected glare from overhead luminaires that emit light at wide angles.

"VDT-preferred" luminaires meet IESNA recommendations for glare reduction (see "For More Information"), based on maximum allowable average luminance at 55° and higher angles from vertical.

The federal supply sources for fluorescent luminaires are the Defense Logistics Agency (DLA) and the General Services Administration (GSA). DLA sells luminaires through its *Energy Efficient Lighting* catalog, available on its Web site. GSA offers them on Schedule 62-II, as well as through its on-line shopping network, *GSA Advantage!* Select or specify models that meet the recommended level for that luminaire type and lamp number.

Where to Find Energy-Efficient Fluorescent Luminaires

Federal buyers should select or specify luminaires with Luminaire Efficacy Ratings (LERs) that meet the recommended levels, based on industry standard tests. However, the LER rating may not be available for some manufacturers' products. If an LER rating is not available, it can be estimated from other photometric data using this formula:

$$\text{LER} = \left(\frac{\text{Total Rated Lamp Lumens} \times \text{Ballast Factor} \times \text{Luminaire Efficiency}}{\text{Input Watts}} \right) .$$

Rated lamp lumens, ballast factor, and luminaire efficiency (see “Definitions,” right) may be found in manufacturers’ luminaire photometric reports and in some catalogues.

Lighting energy savings depend on good lighting design and controls, as well as efficient luminaires. A lighting designer can assist with proper luminaire selection, placement, and choice of occupancy or daylighting controls.

“VDT-preferred” luminaires, while reducing glare on computer screens, may be less efficient than other models. Where greatly reduced glare is not a design need, look for either a VDT-compatible luminaire with a higher LER, or an efficient non-VDT-rated model. Other special situations, such as equipment with high sensitivity to electromagnetic interference or the need for vandal-proof fixtures, may also compromise efficiency.

Definitions

Ballast Factor (BF) is the ratio of the light output of lamp(s) operated by a ballast to the light output of the same lamp(s) operated at rated current and voltage. Also called Relative Light Output (RLO).

Luminaire Efficiency (LE) is the luminaire’s light output, in lumens, divided by the total rated lamp lumens.

Other Design Considerations

Fluorescent Luminaire Cost-Effectiveness Example (2' x 4' recessed, lensed)			
Performance	Base Model	Recommended Level	Best Available
Luminaire Efficacy Rating (LER)	32	62	77
Luminaire Light Output	3600 lumens	3700 lumens	4400 lumens
Power Input	113 watts	60 watts	57 watts
Annual Energy Use	407 kWh	216 kWh	205 kWh
Annual Energy Cost	\$24	\$13	\$12
Lifetime Energy Cost	\$260	\$140	\$130
Lifetime Energy Cost Savings	–	\$120	\$130

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed luminaire life of 15 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

This example shows the cost effectiveness of energy-efficient 2' x 4' recessed, lensed (FL) luminaires. The Base Model uses three 34-watt T-12 lamps, while the Recommended and Best Available models, despite providing equivalent or greater light output (lumens), use only two 32-watt T8s.

Annual energy use is based on 3,600 operating hours/year. Lifetime energy costs and savings are based on a 15-year luminaire lifetime; three sets of lamps would be used over this period. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the example above, the luminaire at the Recommended Level is cost-effective if its price does not exceed the price of the Base Model by more than \$120. The Best Available luminaire will be cost-effective if its price does not exceed the price of the Base Model by more than \$130.

Metric Conversion

1 foot = 30.5 cm

What if my Electricity Price or Hours of Use are different?

To calculate annual or lifetime savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{\text{Your price in ¢/kWh}}{6.0 \text{ ¢/kWh}} \right)$. Similarly, for a different hours of use figure, multiply savings by this ratio: $\left(\frac{\text{Your yearly hours of use}}{3,600} \right)$.

